

**What Is Claimed Is:**

1        1. A method of determining the presence of a  
2 nuclear localization signal in a protein of interest, the  
3 method comprising:

4        selecting a host cell for use in the method, wherein  
5 the host cell contains a nucleus having nucleic acid  
6 encoding a reporter gene therein and wherein the host  
7 cell has a first level of expression of the reporter  
8 gene;

9        identifying a DNA binding domain and an activation  
10 domain for the reporter gene;

11        constructing a chimeric nucleic acid encoding a  
12 fusion protein comprising the DNA binding domain, the  
13 activation domain, and a protein of interest, wherein  
14 elements of the fusion protein other than the protein of  
15 interest have no nuclear localization signals;

16        introducing the chimeric nucleic acid into the host  
17 cell; and

18        determining a second level of expression of the  
19 reporter gene to determine the presence of a nuclear  
20 localization signal in the protein of interest.

1        2. The method of claim 1 wherein the host cell is  
2 a eukaryotic cell.

1        3. The method of claim 1 wherein the host cell is  
2 a yeast cell.

1        4. The method of claim 1 wherein the reporter gene  
2 is a lacZ gene.

1        5. The method of claim 1 wherein the reporter gene  
2 is a selection marker gene.

1        6. The method of claim 5 wherein the selection  
2 marker gene is a HIS3 gene.

1        7. The method of claim 4 or 6 wherein the DNA  
2 binding domain is a LexA protein.

1        8. The method of claim 4 or 6 wherein the  
2 activation domain is a GAL4 activation domain.

1        9. The method of claim 1 wherein the chimeric  
2 nucleic acid further comprises nucleic acid encoding a  
3 promoter to control expression of the fusion protein.

1        10. The method of claim 9 wherein the promoter is  
2 an ADH1 promoter.

1        11. A recombinant host cell comprising:  
2            a nucleus having nucleic acid encoding a reporter  
3 gene therein; and  
4            a chimeric nucleic acid encoding a fusion protein,  
5 the fusion protein comprising a DNA binding domain for  
6 the reporter gene, an activation domain for the reporter  
7 gene, and a protein of interest, wherein elements of the  
8 fusion protein other than the protein of interest have no  
9 nuclear localization signals.

1        12. The recombinant host cell of claim 11 wherein  
2 the host cell is a eukaryotic cell.

1        13. The recombinant host cell of claim 11 wherein  
2 the host cell is a yeast cell.

1        14. The recombinant host cell of claim 11 wherein  
2 the reporter gene is a lacZ gene.

1        15. The recombinant host cell of claim 11 wherein  
2 the reporter gene is a selection marker gene.

1        16. The recombinant host cell of claim 15 wherein  
2 the selection marker gene is a HIS3 gene.

1        17. The recombinant host cell of claim 14 or 16  
2 wherein the DNA binding domain is a LexA protein.

1        18. The recombinant host cell of claim 14 or 16  
2 wherein the activation domain is a GAL4 activation  
3 domain.

1        19. The recombinant host cell of claim 11 wherein  
2 the chimeric nucleic acid further comprises nucleic acid  
3 encoding a promoter to control expression of the fusion  
4 protein.

1        20. The recombinant host cell of claim 19 wherein  
2 the promoter is an ADH1 promoter.

1        21. A chimeric nucleic acid encoding a fusion  
2 protein, the fusion protein comprising a DNA binding  
3 domain for a reporter gene, an activation domain for the  
4 reporter gene, and a protein of interest, wherein  
5 elements of the fusion protein other than the protein of  
6 interest have no nuclear localization signals.

1        22. The chimeric nucleic acid of claim 21 wherein  
2 the reporter gene is a lacZ gene.

1        23. The chimeric nucleic acid of claim 21 wherein  
2 the reporter gene is a selection marker gene.

1        24. The chimeric nucleic acid of claim 23 wherein  
2 the selection marker gene is a HIS3 gene.

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BY*  
1        25. The chimeric nucleic acid of claim 22 or 24  
2 wherein the DNA binding domain is a LexA protein.

1        26. The chimeric nucleic acid of claim 22 or 24  
2 wherein the activation domain is a GAL4 activation  
3 domain.

1        27. The chimeric nucleic acid of claim 21 further  
2 comprising nucleic acid encoding a promoter to control  
3 expression of the fusion protein.

1        28. The chimeric nucleic acid of claim 27 wherein  
2 the promoter is an ADH1 promoter.

1        29. A vector comprising the chimeric nucleic acid  
2 of claim 21.

1        30. A kit comprising the vector of claim 29.

1        31. The kit of claim 30 further comprising host  
2 cells which contain a nucleus having nucleic acid  
3 encoding the reporter gene therein.

1        32. The kit of claim 31 further comprising a  
2 control vector.

1       33. A nucleic acid molecule encoding a modified  
2 LexA protein, wherein the modified LexA protein has no  
3 nuclear localization signal.

1       34. The nucleic acid molecule of claim 33 wherein  
2 the nucleic acid molecule has a nucleotide sequence as  
3 shown in SEQ ID NO:1.

1       35. The nucleic acid molecule of claim 33 wherein  
2 the nucleic acid molecule encodes an amino acid sequence  
3 as shown in SEQ ID NO:2.

1       36. A modified LexA protein, wherein the modified  
2 LexA protein has no nuclear localization signal.

1       37. The modified LexA protein of claim 36 wherein  
2 the protein has an amino acid sequence as shown in SEQ ID  
3 NO:2.

1       38. A method of determining the presence of a  
2 nuclear export signal in a protein of interest, the  
3 method comprising:  
4       selecting host cells for use in the method, wherein  
5 each of the host cells contain a nucleus having nucleic  
6 acid encoding a reporter gene therein;  
7       identifying a DNA binding domain and an activation  
8 domain for the reporter gene;  
9       constructing a chimeric nucleic acid encoding a  
10 fusion protein comprising the DNA binding domain, the  
11 activation domain, and a nuclear localization signal,  
12 wherein elements of the fusion protein have no nuclear  
13 export signals;  
14       introducing the chimeric nucleic acid into one of  
15 the host cells;

16 determining a first level of expression of the  
17 reporter gene;  
18 constructing a second chimeric nucleic acid encoding  
19 a second fusion protein comprising the DNA binding  
20 domain, the activation domain, the nuclear localization  
21 signal, and a protein of interest;  
22 introducing the second chimeric nucleic acid into  
23 another one of the host cells; and  
24 determining a second level of expression of the  
25 reporter gene to determine the presence of a nuclear  
26 export signal in the protein of interest.

1 39. The method of claim 38 wherein the host cells  
2 are eukaryotic cells.

1 40. The method of claim 38 wherein the host cells  
2 are yeast cells.

1 41. The method of claim 38 wherein the reporter  
2 gene is a lacZ gene.

1 42. The method of claim 38 wherein the reporter  
2 gene is a selection marker gene.

1 43. The method of claim 42 wherein the selection  
2 marker gene is a HIS3 gene.

1 44. The method of claim 38 wherein the nuclear  
2 localization signal is an SV40 nuclear localization  
3 signal.

1 45. The method of claim 41 or 43 wherein the DNA  
2 binding domain is a LexA protein.

1        46. The method of claim 41 or 43 wherein the DNA  
2 binding domain and the nuclear localization signal are a  
3 LexA protein.

1        47. The method of claim 41 or 43 wherein the  
2 activation domain is a GAL4 activation domain.

1        48. The method of claim 38 wherein the chimeric  
2 nucleic acid further comprises nucleic acid encoding a  
3 promoter to control expression of the fusion protein.

1        49. The method of claim 38 wherein the second  
2 chimeric nucleic acid further comprises nucleic acid  
3 encoding a promoter to control expression of the second  
4 fusion protein.

1        50. The method of claim 48 or 49 wherein the  
2 promoter is an ADH1 promoter.

1        51. A recombinant host cell comprising:  
2           a nucleus having nucleic acid encoding a reporter  
3 gene therein; and  
4           a chimeric nucleic acid encoding a fusion protein,  
5 the fusion protein comprising a DNA binding domain for  
6 the reporter gene, an activation domain for the reporter  
7 gene, and a nuclear localization signal, wherein elements  
8 of the fusion protein have no nuclear export signals.

1        52. The recombinant host cell of claim 51 wherein  
2 the fusion protein further comprises a protein of  
3 interest.

1        53. The recombinant host cell of claim 51 wherein  
2 the host cell is a eukaryotic cell.

1        54. The recombinant host cell of claim 51 wherein  
2 the host cell is a yeast cell.

1        55. The recombinant host cell of claim 51 wherein  
2 the reporter gene is a lacZ gene.

1        56. The recombinant host cell of claim 51 wherein  
2 the reporter gene is a selection marker gene.

1        57. The recombinant host cell of claim 56 wherein  
2 the selection marker gene is a HIS3 gene.

1        58. The recombinant host cell of claim 51 wherein  
2 the nuclear localization signal is an SV40 nuclear  
3 localization signal.

1        59. The recombinant host cell of claim 55 or 57  
2 wherein the DNA binding domain is a LexA protein.

1        60. The recombinant host cell of claim 55 or 57  
2 wherein the DNA binding domain and the nuclear  
3 localization signal are a LexA protein.

1        61. The recombinant host cell of claim 55 or 57  
2 wherein the activation domain is a GAL4 activation  
3 domain.

1        62. The recombinant host cell of claim 51 wherein  
2 the chimeric nucleic acid further comprises nucleic acid  
3 encoding a promoter to control expression of the fusion  
4 protein.

1        63. The recombinant host cell of claim 62 wherein  
2 the promoter is an ADH1 promoter.

1        64. A chimeric nucleic acid encoding a fusion  
2 protein, the fusion protein comprising a DNA binding  
3 domain for a reporter gene, an activation domain for the  
4 reporter gene, and a nuclear localization signal, wherein  
5 elements of the fusion protein have no nuclear export  
6 signals.

1        65. The chimeric nucleic acid of claim 64 wherein  
2 the fusion protein further comprises a protein of  
3 interest.

1        66. The chimeric nucleic acid of claim 64 wherein  
2 the nuclear localization signal is an SV40 nuclear  
3 localization signal.

1        67. The chimeric nucleic acid of claim 64 wherein  
2 the DNA binding domain is a LexA protein.

1        68. The chimeric nucleic acid of claim 64 wherein  
2 the DNA binding domain and the nuclear localization  
3 signal are a LexA protein.

1        69. The chimeric nucleic acid of claim 64 wherein  
2 the activation domain is a GAL4 activation domain.

1        70. The chimeric nucleic acid of claim 64 wherein  
2 the chimeric nucleic acid further comprises nucleic acid  
3 encoding a promoter to control expression of the fusion  
4 protein.

1        71. The chimeric nucleic acid of claim 70 wherein  
2 the promoter is an ADH1 promoter.

1        72. A vector comprising the chimeric nucleic acid  
2 of claim 64.

1        73. A kit comprising the vector of claim 72.

1        74. The kit of claim 73 further comprising host  
2 cells which contain a nucleus having nucleic acid  
3 encoding the reporter gene therein.

1        75. The kit of claim 74 wherein the reporter gene  
2 is a lacZ gene.

1        76. The kit of claim 74 wherein the reporter gene  
2 is a selection marker gene.

1        77. The kit of claim 76 wherein the selection  
2 marker gene is a HIS3 gene.

1        78. The kit of claim 73 further comprising a  
2 control vector.